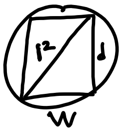

$s = k\cdot(w\cdot d^2)$

$s = kw(144 - w^2)$

$s = k(144w - w^3)$

$12^2 = w^2 + d^2$

$s' = k(144 - 3w^2) = 0$

$d^2 = 144 - w^2$

max at

$144 = 3w^2$

$s'' = k(-6w) < 0$

$\sqrt{\frac{144}{3}} = w$

Oct 13-8:58 AM

4.4c Modeling and Optimization

Examples from Economics

Maximum Profit: If there is a maximum profit, it occurs when marginal revenue = marginal cost

$P = R - C$

$P' = R' - C' = 0$

$R' = C'$

Oct 25-8:00 AM

Suppose r(x) = 9x and c(x) = x^3 - 6x^2 + 15x, where x represents 1000's of units. Is there a production level that maximizes profit? If so, what is it?

$R' = C'$

$P = R - C$

$9 = 3x^2 - 12x + 15$

$P' = 9 - (3x^2 - 12x + 15) = 0$

$x = .585786$

$P'' = -6x + 12$

$x = 3.41421$

$P''(.585786) > 0$

max profit at

$P''(3.41421) < 0$

Oct 25-8:05 AM

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average cost = c(x)/x

Minimum Average Cost: If there is a minimum average cost, it occurs when average cost = marginal cost.

$AC = \frac{c(x)}{x}$

$AC' = \frac{x\cdot c'(x) - c(x)\cdot 1}{x^2} = 0$

$x\cdot c'(x) = \frac{c(x)}{x}$

Oct 25-8:06 AM

Suppose c(x) = x^3 - 6x^2 +15x, where x represents 1000's of units. Is there a production level that minimizes average cost? If so, what is it?

$AC = \frac{c(x)}{x} = \frac{x^3 - 6x^2 + 15x}{x} = x^2 - 6x + 15$

$AC' = 2x - 6 = 0$

min at $x = 3$

$3x^2 - 12x + 15 = x^2 - 6x + 15$

$2x^2 - 6x = 0$

$AC'' = 2 > 0$

$2x(x - 3) = 0$

$x = 0 \quad x = 3$

Oct 25-8:08 AM

4.4

27\. Tour service

\$200/person or discount if more than 50 people

discount = \$2 off for each person beyond 50

6000 fixed cost

\$32/person additional costs

what if 60 people discount = 20 off

$2\cdot 10$

charge \$180/person

$200 - 2(x - 50)$

$2\cdot(x - 50)$

$P = 180\cdot 60 - (6000 + 32\cdot 60)$

Oct 13-10:24 AM